

REMARKS

Claims 1-11, 13-18, 20-21, 23-52 and 57-59 are pending in the present case. Claims 1, 4, 11, 17-18, 25-28, 35-37, 42, 50-52 and 57-58 are amended herein. Claims 19 and 53-56 are canceled herein; Claims 12 and 22 were previously cancelled. Applicant respectfully requests reconsideration in view of the above amendments to the present application, and the arguments set forth below. No new matter is added herein.

CLAIM REJECTIONS UNDER 35 USC § 103(a) - INSENSER & FURTEK REFERENCES

Claims 1-36, 42-49 and 51-57 are rejected under 35 USC § 103(a) over US Patent No. 6,460,172 to Insenser Farre, et al., (hereinafter Insenser) in view of US Patent No. 5,894,565 to Furtek, et al. (hereinafter Furtek). Applicant has reviewed the references cited and respectfully asserts that they do not teach or suggest the embodiments of the present invention recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57 for the following rationale.

Claims 19 and 53-56 are cancelled herein and Claims 12 and 22 were cancelled previously. Applicant thus respectfully asserts that their present rejection under 35 USC § 103(a) is moot.

As Applicant understands the reference, Insenser teaches a microprocessor based mixed signal field programmable integrated device. Insenser, c. 1, ll. 1-12. Applicant also understands Insenser to expressly teach that RAM (Random Access Memory) is used for both data and programs. Id. at col. 3, l. 16. Applicant further understands the reference to expressly teach that an analog subsystem therein "is composed of fixed functionality blocks of coarse granularity." Id. at col. 4, ll. 38-39. While the reference does teach field programmability and configurability, Applicant

notes that such teaching is expressly delimited to within two configuration contexts (Id. at c. 4, l. 1; c. 4, l. 66-c. 5 l. 2). The express teaching of the Insenser reference thus differs from the claimed embodiments of the present invention recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57.

As amended herein, independent Claim 1 reads as shown below, with underlining added for emphasis.

1. A microcontroller circuit comprising:
 - a bus;
 - a microprocessor coupled to said bus;
 - a memory coupled to said bus, wherein said memory comprises a non-volatile memory; and
 - a plurality of functionalities coupled to said bus, wherein said functionalities, wherein said non-volatile memory functions to program said functionalities and wherein said plurality of functionalities comprise:
 - an interconnect wherein said interconnect is dynamically configurable and programmable;
 - an analog functional block coupled to said interconnect wherein said analog function block is dynamically configurable and programmable to perform one or more of a plurality of various analog functions; and
 - a dynamically configurable and programmable digital functional block coupled to said interconnect.

Independent Claims 11, 17, 35, 42, 51 and 52 are amended herein after a similar fashion as Claim 1. As amended herein, Claims 1, 11, 17, 35, 42, 51 and 52 and their respective dependent claims recite that (1) a non-volatile memory that functions to program multiple programmable functionalities of a microcontroller, which includes (2) an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Storing code for dynamically programming programmable functionalities in non-volatile memory such as Read-Only Memory (ROM) provides the benefit of freeing limited volatile memory resources such as Random Access Memory (RAM)

for tasks such as storing data for use by the running processor. This advantageously allows the microcontroller to efficiently function during re-programming, which is thus executable on the fly.

Microcontrollers are useful in embedded system applications that interface to the "real world," which is analog in nature. While conventional microcontrollers such as taught by Insenser sometimes provide analog to digital conversion capability, true analog peripherals are rare and analog signals must be multiplied, filtered, or otherwise conditioned before conversion to digital. While conventional analog functional components are available for use with microcontrollers, they still require at least effective electrical coupling and signal synchronization and transfer modality to effectuate their use or as with the analog sub-system taught by Insenser, have other limitations. In Insenser's case, the reference expressly teaches that its analog sub-system "is composed of fixed functionality blocks of coarse granularity." *Id.* at col. 4, ll. 38-39. In contrast, the analog functionalities claimed herein are readily dynamically programmable and configurable to perform any of a wide variety of analog functions.

Thus, the teaching of Insenser differs from the claimed embodiments recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57. As shown above with reference to Claim 1, Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57 all advantageously relate to (1) a non-volatile memory that functions to program multiple programmable functionalities of a microcontroller and (2), which includes an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Applicant finds no teaching or suggestion within the Insenser reference that is directed towards using a non-volatile memory that functions to program multiple

programmable functionalities of a microcontroller. On the contrary, Applicant respectfully asserts that, in teaching using RAM (e.g., volatile memory) for programming (Id. at col. 3, l. 16), the Insenser reference clearly and expressly teaches away from the claimed embodiments recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57, which relate to using non-volatile memory to program multiple programmable functionalities of a microcontroller.

Applicant also finds no teaching or suggestion within the Insenser reference that is directed towards an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions. On the contrary, Applicant respectfully asserts that, in teaching analog subsystem that "[are] composed of fixed functionality blocks of coarse granularity" (Id. at col. 4, ll. 38-39), the Insenser reference clearly and expressly teaches away from the claimed embodiments recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57, which relate to an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

As Applicant understands the reference, Furtek teaches a FPGA with distributed random access memory (RAM). Furtek, c. 2, l. 59-c. 3, l. 54. Applicant notes that the reference states that it "relates to programmable multifunctional digital logic array [ICs] of the type known as [FPGAs], and in particular to improvements in the structure of the configurable logic cells of such FPGAs, ..." Id. at c. 1, ll. 5-17.

Moreover, Applicant notes that Furtek expressly teaches that dedicated function elements therein "can be memory structures such as random access memory (RAM) blocks or other dedicated or specialized circuits, such as ... analog logic ..." Id. at col. 11, l. 56-col. 12, l. 7. Applicant respectfully asserts that, in

teaching that function elements are dedicated, in contrast to programmable and/or configurable, and that they are "memory structures" (Id.) or "dedicated or specialized circuits, such as ... analog logic" (Id.), the Furtek reference clearly and expressly teaches away from the claimed embodiments recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57, which relate to an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Applicant finds no teaching or suggestion within the Furtek reference that is directed towards using a non-volatile memory that functions to program multiple programmable functionalities of a microcontroller, as recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57. Applicant also finds no teaching or suggestion within Furtek that is directed towards an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions, as recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57. On the contrary, as discussed above, Furtek teaches away from these claimed embodiments.

Applicant finds nothing in Furtek that cures the defects of Insenser, discussed above and nothing in Insenser that cures these defects of Furtek.

Moreover, as discussed above, both Insenser and Furtek expressly teaches away from the claimed embodiments of the present invention recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57. Thus, Applicant respectfully asserts that the references express or imply no motivation, as well as no teaching or suggestion for combining their teachings with those of each other to achieve the claimed embodiments recited in Claims 1-11, 13-18, 20-21, 23-36, 42-

49, 51-52 and 57 herein, which relate to a non-volatile memory that functions to program multiple programmable functionalities of a microcontroller and that includes an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Thus, Applicant respectfully asserts that Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57 are allowable under 35 USC § 103(a) over the cited references.

CLAIM REJECTIONS UNDER 35 USC § 102(E) - INSENER REFERENCE

Claims 37-41 are rejected under 35 USC § 102(e) over Insenser. Applicant has reviewed the reference cited and respectfully asserts that it does not teach or suggest the claimed embodiments recited in Claims 37-41 for the following rationale.

Applicant respectfully repeats each and every point relating to the Insenser reference discussed above in reference to the rejections (of Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57) under 35 USC 103(a).

As amended herein, Claim 37 reads as shown below, with underlining added for reference.

37. A microcontroller circuit, comprising:
a programmable non-volatile memory containing programming code;
a plurality of dynamically programmable analog circuit blocks configured to receive a first subset of said programming data from said programmable memory and wherein said analog circuit blocks are dynamically configurable and programmable to perform a plurality of various analog functions; and
a plurality of dynamically programmable digital circuit blocks configured to receive a second subset of said programming data from said programmable memory, at least a first one of said programmable digital circuit blocks being coupled directly or indirectly to at least a first one of said programmable analog circuit blocks.

As amended herein, Claim 37 and its dependent claims 38-41 recite that (1) a non-volatile memory stores programming code and (2) analog circuit blocks that are dynamically configurable and programmable perform one or more of a plurality of various analog functions.

Storing programming code for dynamically programming programmable functionalities in non-volatile memory and analog circuit blocks that are dynamically configurable and programmable to perform one or more of a plurality of various analog functions, as recited in Claims 37-41 have beneficial advantages, as discussed above.

The teaching of Insenser differs from the claimed embodiments recited in Claims 37-41. As shown above with reference to Claim 37, Claims 37-41 all advantageously relate to (1) a non-volatile memory storing programming code and (2) an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Applicant finds no teaching or suggestion within the Insenser reference that is directed towards using a non-volatile memory storing program code for programming multiple programmable functionalities of a microcontroller. On the contrary, Applicant respectfully asserts that, in teaching using RAM (e.g., volatile memory) for programming (Id. at col. 3, l. 16), the Insenser reference clearly and expressly teaches away from the claimed embodiments recited in Claims 37-41, which relate to storing programming code in non-volatile memory for programming multiple programmable functionalities of a microcontroller.

Applicant also finds no teaching or suggestion within the Insenser reference that is directed towards an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions. On the contrary, Applicant respectfully asserts that, in teaching analog subsystem that "[are] composed of fixed functionality blocks of coarse granularity" (Id. at col. 4, ll. 38-39), the Insenser reference clearly and expressly teaches away from the claimed embodiments recited in Claims 37-41, which relate to an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Thus, Applicant respectfully asserts that Claims 37-41 are allowable under 35 USC § 102(e) over the cited reference.

CLAIM REJECTIONS UNDER 35 USC § 102(A) & (B) - FURTEK REFERENCE

Claim 50 is rejected under 35 USC § 102(a) and (b) over Furtek. Applicant has reviewed the reference cited and respectfully asserts that it does not teach or suggest the claimed embodiments recited in Claim 50 for the following rationale.

Applicant respectfully repeats each and every point relating to the Furtek reference discussed above in reference to the rejections (of Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57) under 35 USC 103(a).

As amended herein, Claim 50 reads as shown below, with underlining added for emphasis.

50. A programmable analog circuit in a microcontroller, comprising a matrix of n by m plurality of dynamically configurable and programmable analog circuit blocks, each coupled to an adjacent block, for providing one or more of a plurality of various analog functions.

As amended herein, Claim 50 recites a programmable analog circuit in a microcontroller comprising dynamically configurable and programmable analog circuit blocks for providing one or more of a plurality of various analog functions.

Analog circuit blocks in a microcontroller that are dynamically configurable and programmable to perform one or more of a plurality of various analog functions, as recited in Claim 50 have beneficial advantages, as discussed above.

The teaching of Furtek differs from the claimed embodiment recited in Claim 50. As shown above, Claim 50 advantageously relates to analog circuit blocks that are dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Applicant finds no teaching or suggestion within Furtek that is directed towards an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions, as recited in Claim 50 herein. On the contrary, as discussed above, Furtek teaches away from this claimed embodiment.

Thus, Applicant respectfully asserts that Claim 50 is allowable over Furtek under 35 USC § 102(a) and (b).

CLAIM REJECTIONS UNDER 35 USC § 103(a) - INSENSER & GAMAL REFERENCES

Claims 58 and 59 are rejected under 35 USC § 103(a) over Insenser in view of US Patent No. 5,754,826 to Gamal, et al. (hereinafter Gamal). Applicant has reviewed the references cited and respectfully asserts that they do not teach or suggest the embodiments of the present invention recited in Claims 58 and 59 for the following rationale.

Applicant respectfully repeats each and every point relating to the Insenser reference discussed above in reference to the rejections of Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57 (also under 35 USC 103(a)).

As amended herein, independent Claim 58 reads as shown below, with underlining added for emphasis.

58. In a system disposed in an integrated circuit, said system comprising:
- a microcontroller comprising a non-volatile program memory;
 - a subsystem coupled to said non-volatile program memory, comprising a plurality of analog functionalities and of digital functionalities that are both configurable according to a user input wherein said analog functionalities are dynamically programmable to perform one or more of a plurality of various analog functions and wherein said analog functionalities and said digital functionalities are programmed with code stored in said non-volatile program memory;
 - an interconnecting mechanism configurable for selectively interconnecting said plurality of analog functionalities and said plurality of digital functionalities according to said user input; and
 - a coupling mechanism coupled to said subsystem that is configurable to implement a connectability state for said system by which said system is connectable to an external entity according to said user input, a method of configuring said system comprising:
 - a) selecting a function from the list consisting of analog functions, digital functions, and; mixed analog and digital functions
 - b) selecting an interconnection state to effectuate an interconnection between said analog functionalities and said digital functionalities corresponding to said function;

- c) selecting said connectability state to effectuate an connection between said system and an external entity corresponding to said function; and
- d) implementing said function, said interconnection state, and said connectability state according to said a), said b) and said c).

As amended herein, independent Claim 58 and its dependent Claim 59 recite a method of configuring a microcontroller system, which has a non-volatile program memory and analog functionalities which are dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Storing programming code for dynamically programming programmable functionalities in non-volatile program memory and analog functionalities that are dynamically configurable and programmable to perform one or more of a plurality of various analog functions, as recited in Claims 58-59 have beneficial advantages, as discussed above.

The teaching of Insenser differs from the claimed embodiments recited in Claims 58 and 59. As shown above with reference to Claim 58, Claims 58 and 59 advantageously relate to (1) a non-volatile memory that functions to program multiple programmable functionalities of a microcontroller and (2), which includes an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Applicant finds no teaching or suggestion within the Insenser reference that is directed towards using a non-volatile memory that functions to program multiple programmable functionalities of a microcontroller. On the contrary, Applicant respectfully asserts that, in teaching using RAM (e.g., volatile memory) for programming (Insenser at col. 3, l. 16), the Insenser reference clearly and expressly teaches away from the claimed embodiments recited in Claims 58 and 59, which

relate to using non-volatile memory to program multiple programmable functionalities of a microcontroller.

Applicant also finds no teaching or suggestion within the Insenser reference that is directed towards an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions. On the contrary, Applicant respectfully asserts that, in teaching analog subsystem that "[are] composed of fixed functionality blocks of coarse granularity" (Id. at col. 4, ll. 38-39), the Insenser reference clearly and expressly teaches away from the claimed embodiments recited in Claims 1-11, 13-18, 20-21, 23-36, 42-49, 51-52 and 57, which relate to an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

As Applicant understands the reference, Gamal's teaching "relates to the computer aided design of [ICs], and more particularly to the design of an [IC that] is intended to be manufactured by a number of foundries employing different fabrication processes." Gamal, c. 1, ll. 1-10. However, Applicant finds no teaching or suggestion therein directed towards storing programming code for dynamically programming programmable functionalities in non-volatile program memory and analog functionalities that are dynamically configurable and programmable to perform one or more of a plurality of various analog functions, as recited in Claims 58-59

Further, in expressly directing its teaching to CAD for ICs, Applicant respectfully asserts that Gamal teaches away from an embodiment recited in Claims 58 and 59 herein, which recite a method of configuring a microcontroller system, which has a non-volatile program memory and analog functionalities which

are dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Applicant finds nothing in Gammel that cures the defects of Insenser, discussed above and nothing in Insenser that cures these defects of Gammel.

Moreover, as discussed above, both Insenser and Gammel expressly teach away from the claimed embodiments of the present invention recited in Claims 58 and 59. Thus, Applicant respectfully asserts that the references express or imply no motivation, as well as no teaching or suggestion for combining their teachings with those of each other to achieve the claimed embodiments recited in Claims 58 and 59 herein, which relate to a non-volatile memory that functions to program multiple programmable functionalities of a microcontroller and that includes an analog functionality that is dynamically configurable and programmable to perform one or more of a plurality of various analog functions.

Thus, Applicant respectfully asserts that Claims 58 and 59 are allowable under 35 USC § 103(a) over the cited references.

CONCLUSION

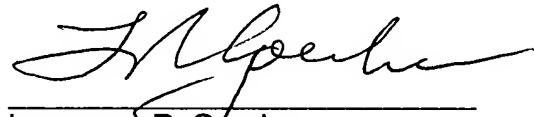
By the rationale stated above, Applicant respectfully asserts that the references cited do not teach or suggest embodiments of the present invention as recited in Claims 1-11, 13-18, 20-21, 23-52 and 57-59, and that these claims are thus allowable under 35 U.S.C. 102(a), (b) and (e) and 35 U.S.C. 103(a). Accordingly, Applicant respectfully request that the rejections there under be withdrawn and that Claims 1-11, 13-18, 20-21, 23-52 and 57-59 be allowed.

Please charge our deposit account No. 23-0085, for any unpaid fees.

Respectfully submitted,

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